Group C, Day Two Needs

Energy Problems, Near Term

Problem: Lack of Renewable Energy Sources for Electricity Generation

- Need: Incentives
  - Stable tax policy
  - Accelerated depreciation
  - Investment tax credit (longer than 10 years)
- Need: Siting; exemption from or streamline NEPA (fed land specific)
  - Ecological surveys to establish regional baselines
  - Environmental impacts/human impacts data
- Off-shore wind
  - Need grid integration studies
  - Need platform development
- Need: T&D
  - Address institutional issues
  - Address DG insertion
  - Need transmission studies
  - Need incentives to get small producers in/avoided cost issues
  - Need grid/dg management and control systems
    - Ancillary services cost center for PJM ($6M/year)
- Need: Loan guarantee funds
- Need: Biomass/Biogas
  - Need gasification pilot plants of 5kW – 50MW
  - Need to look at fuel gathering and distribution systems
  - Need better controls (fuel differences make operations unstable)
  - Need to develop better processes
  - Need practical experience/pilot plants
- Need: Biomass liquids
  - Plants coming online in 3-5 years
  - 25 x 25 program at USDA
  - Need to address institutional issues
  - 40% of corn crop can make 1 million bbl/day
  - Need pyrolysis R&D pathway
  - Need ref of future info?
  - Need cost/production reduction act.
  - Need water info/sustainability
    - R&D on energy crop limits (DOE doc of biomass availability)
- Need: Low head hydro
  - No real tech needs
  - Incentives issue
  - Could double US hydro production
  - Need baseline EQ/impact information
  - Good baseload player

- Need: Tech development to drive down cost of solar

Problem: Refining Capacity

- Need incentives
- Siting—need research on baseline environmental issues
- Need tax relief
- Need more pipelines
    - Reduce friction in pipelines to reduce energy consumption?
- Need process improvements
    - Reduce water inputs
    - Reduce emissions (air/water)
    - Look to co-siting/industrial ecology

Problem: T&D

- Need large scale upgrades
    - Need load flow management studies
- Need federal role in national grid
    - Generate market cost
    - Regional grid management
- Need materials R&D to reduce losses
    - Losses average 11%; as high as 20%
- Need to examine vehicle-to-grid issues
    - Power evaluation R&D
    - Power control R&D
        - Communication systems seriously lacking

Problem: Energy Impacts on Water Quality and Environment (air-water; hg; drift)

- CO2
    - Need to look extra-regional
    - Need carbon tax
    - Need carbon seq techs (mq to get numbers)
    - Need to make use of low carbon fuels
    - Need market for credits
    - R&D to retrofit plants to burn low-sulfur diesel ($19M/plant)
        - Sprayers
- Hg
    - Need additional R&D on source/persistence
    - Hg cycle/atmospheric deposition research
    - Need source capture
        - Scrubbers don't exist
    - Need Hg emissions data from plants
- Perchlorate
    - Contaminates surface and groundwater
    - Need understanding/tracking/treatment
- MTBE
    - Need remediation technologies

- Biomass production
    - Need understanding of quantity/quality implications of large-scale production
- Arsenic/heavy metals/microbial/geochemical
    - Need fate and transport research in surface water/groundwater/air
    - Need to look for emerging contaminants
- Nuclear waste
    - Need long-term performance assessments

Energy Problems, Long-Term

Problem: Long-range renewables

- Need: Market penetration
    - Attain energy independence/liquid fuels key
- Need to attack technology scale up issues
    - Cellulosic ethanol problems
- Need resource allocation methodology
    - Identify quantity/quality limits to scale-up
- Need liquid fuel demand reductions
    - Technology available/market failure/inst. Issues
- Wind targeting 6% by 2020
    - Need more RPSs
- Need to understand limits of renewables
    - Resource
    - T&D
    - Pace of development
    - Studies on small scale being done (WI)

Problem: Energy use/production inefficiencies

- Need understanding of limits and benefits of conservation/DSM
    - Reduce home consumption by a factor of 2
        - Facilitate through stable tax credits
    - Examine CAFÉ standards
- Understand positive water impacts of HTGC reactors
- Nuclear vs renewables study vis a vis water quality/quantity
- Builder/owner disconnect
- Need to drive down total consumption (per capita dropping, but capita increasing)
- Need long-range transportation evaluation
    - Electric trains to replace trucking
- **Need unbiased, system-level, integrated assessment (examine energy in toto)**
- Need cost-effective production of h2
    - $25/gal equivalent today
    - Need storage density improvements

Water Problems, Near-term

Problem: Infrastructure Decay (near and long term problem)

- Need to make problem visible
- Need money/funding for upgrades
- Need security technologies
    - On-line monitoring
    - Early warning
    - Chemical sensors
    - Rad sensors
- Need POU treatment technologies

Problem: Competing Demands

- Need GIS-based regional analysis of uses and interactions of water-energy
    - Energy flows to ag
    - Water flows to ag/energy
    - Water supply
        - Examine data variations across states (some report water allotments, not withdraws, some have lower or higher groundwater withdrawal measurement limits)
    - Need data at variable resolutions/needs to be watershed based
    - Piggyback on SWRR (sustainable water resources roundtable)
- Need: Improve water use efficiency of crops (ex. Biomass)
    - Solution: Improve soil properties/conservation tillage
- Need: Reduce energy/water intensity on the farm
    - Move to better-than drip irrigation
- Need to understand localized groundwater impacts/potential regional groundwater impacts
- Need to understand reuse energy cost (10-20%)
- Need energy optimization research
    - Need to reduce energy consumption by ozone/membranes/UV treatment (looking at 10% increase in energy consumption in near term)
    - Need hydraulic vs treatment cost study
    - Need understanding of co-gen/standby power
        - What is sufficient backup power?
- Need: Understanding/study of cost of diversions/lockage/river transportation on power production
    - Need localized studies of how/when downstream generation is impacted by upstream uses
- Need understanding of groundwater withdrawals
    - Examine surface water impacts within watersheds
    - Cost problem—know how to do it
    - Model improvements
        - Geologic differences
        - Site-specific

Problem: Water quality (near and long term)

- Need: Understanding of who pays for downstream impacts
  - Need to model cumulative long term impacts downstream (EPA basins_
- Need: Water distribution quality…how to ensure quality over time?
- Need: Distributed treatment technologies
  - Examine DG-DT synergy
  - Reduce energy consumption
- Need: Science based understanding of emerging contaminants
  - Human/ecological health issue?